

## **Remarks**

### **Amendments to Claims**

Independent claims 1, 6, and 12 have been amended to more clearly define the recited invention. The methods recited in each of these claims include the use of a welding laser beam to form a molten weld pool in aluminum or magnesium members to be joined. Because aluminum and magnesium alloys typically display a high level of thermal conductivity, Applicants' claimed methods also include the step of heating a zone of the members to slow the rate of solidification of the molten weld pool formed by the welding laser beam. The amendments to these independent claims makes clear that such heating is with a heating source that is supplemental to the heating for metal melting by the welding laser beam.

Paragraphs 0001, 0008-0010, 0026-0030, and Figures 4 and 5 of the specification describe the use of a heating source that is supplemental to the laser welding beam. The laser welding beam provides heat for creating the molten weld pool for fusing the aluminum and/or magnesium members. And the supplemental heat source is used to slow the rate of solidification of the weld pool to form a porosity-free weld bead. While the laser beam is typically directed to a surface of one of the members to be joined, the supplemental heating source may be directed to an opposing surface (Figure 4) or to the same surface (Figure 5). The supplemental heating source may be another laser, a flame torch, an ultrasonic device, microwave apparatus, a resistance heating element, or the like (paragraph 0026). Or as described in Figure 5 and paragraph 0029, the supplemental heating source may be fractionated from a laser beam that yields both the welding beam and a supplemental beam.

### **The Claim Rejections**

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Banas et al (US 4,000,392).

Claims 12-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Hillman et al (US 5,142,119).

Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Banas et al as stated in the paragraph above and further in view of Austin et al (US Re. 36,926).

Claims 6-11 and 15-17 are rejected under 35 U.S.C. 103(a) s being unpatentable over Hillman et al as stated in the paragraph above and further in view of Banas et al.

The Examiner is respectfully requested to reconsider and remove these rejections for the following reasons.

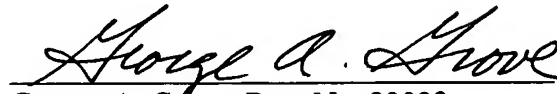
#### Reasons for Removing the Claim Rejections

The Banas et al and Hillman et al patents disclose methods of making laser welds. But the disclosed methods are not directed to welding light weight and high thermal conductivity metal alloys such as those based on aluminum or magnesium. And neither of these patents teaches or suggests any practice for supplementing the heat of the welding laser beam to slow the rate of solidification of the molten weld pool to avoid trapping welding gases. Neither patent suggests the use of a supplemental heat source to reduce porosity in the solidifying weld as it rapidly loses heat to surrounding high conductivity metal. The Banas et al trailer shield contains a protective gas, it does not provide supplemental heat. Hillman et al are trying to weld zinc galvanized steel with a laser beam and a flow of oxygen gas, but no supplemental heat source.

The Austin et al patent is cited as disclosing practices for controlling the formation of welds based on images of weld puddles. But the disclosure pertains to gas tungsten arc welding. Austin et al do not teach or suggest Applicants' methods of forming laser welds in light weight metal alloys using a supplemental heat source to manage the solidification of the laser energy formed weld pool.

It is respectfully requested that all rejections of Applicants' claims be removed, and that claims 1-17 be allowed and this application passed to issue.

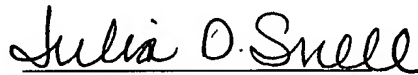
Respectfully Submitted,



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I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on: 9/8/05.



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